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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/667,706	09/22/2000	Ken Inoue	NEC00P267-hk	9955

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EXAMINER

OWENS, DOUGLAS W

ART UNIT	PAPER NUMBER
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2811

DATE MAILED: 08/20/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/667,706

Applicant(s)

INOUE ET AL.

Examiner

Douglas W Owens

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 30 May 2002.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-22 is/are pending in the application.
- 4a) Of the above claim(s) 1-4, 10 and 11 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 5-9 and 12-22 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 12, 13.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. Claims 6 and 13 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. The claims require that heat treating removes the unreacted metal film. The written specification discloses that the unreacted metal film is removed with a mixed solution of sulfuric acid and hydrogen peroxide (page 11, lines 1 and 2).

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

4. Claims 5, 8, 12, 15, 18 and 20 rejected under 35 U.S.C. 102(e) as being anticipated by US patent No. 5,981,324 to Seo et al.

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Regarding claims 5, 12 and 15, Seo et al. teaches a method of manufacturing a semiconductor device, in which a DRAM section and a logic section are formed on a semiconductor substrate that is isolated into elements, said method comprising:

forming a metal film directly on surfaces of source/drain regions and gate regions in the DRAM section and logic section (Col. 3, lines 40 – 53; Col. 7, line 65 – Col. 8, line 14);

heat treating said device to react said metal film with said surfaces to concurrently form a metal silicide layer in each of the DRAM section and logic section (Col. 8, lines 11 – 24).

Regarding claim 8, Seo et al. teaches a method, wherein dopant implantation into gates are carried out concurrently with formation of the source/drain regions that constitute transistors in the DRAM section and the logic section, and thereby P-N gates are formed (Col. 2, lines 51 – 55; Col. 6, lines 10 – 20 and 37 – 39).

Regarding claim 18, Seo et al. teaches a method, wherein the source/drain regions comprise a high dopant concentration.

Regarding claim 20, Seo et al. teaches a method, further comprising forming source/drain regions in the memory cell section and adjacent circuit section.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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6. Claims 6, 7, 9, 13, 14, 16, 17, 19, 21 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Seo et al.

Regarding claims 6 and 13, Seo et al., teaches forming a metal film over the entire surface of the substrate (Col. 3, lines 40 – 53). Seo et al. does not teach a method, wherein the heat treating removes the unreacted metal film. Seo et al. teaches removing the unreacted metal film with NH_4OH or H_2SO_4 . It is known in the art to combine etching of metal with a thermal treatment. It would have been obvious to one of ordinary skill in the art to incorporate a thermal treatment with the removal of the unreacted metal, since it is desirable to shorten process times, as well as reducing the resistance of the silicide layer.

Regarding claims 7 and 14, Seo et al. teaches a method, wherein the metal film is titanium (Col. 3, lines 40 – 42; Col. 8, lines 11 – 13).

Regarding claim 9, Seo et al. teaches a method, further comprising:

forming a bit line contact (Col. 8, lines 39 – 50). Seo et al. does not teach connecting the bit line to the logic transistor. The logic transistor must be electrically connected to the memory transistor for the purpose of enabling communication between the two devices. It would have been obvious to one having ordinary skill in the art at the time the invention was made to connect the bit line to the logic transistor since it is a necessary feature of the invention for communication between devices to be possible.

Regarding claim 16, Seo et al. does not teach a method, wherein the metal film is formed by sputtering. Seo et al. is silent with respect to the method of forming the metal film. Sputtering is a well known method of depositing metal layers. It would have been

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obvious to one having ordinary skill in the art to select a known method of forming the metal film, since Seo et al. does not disclose a method.

Regarding claim 17, Seo et al. teaches annealing the device in a nitrogen atmosphere, but is silent with respect to the anneal temperature and time. Seo et al. does not teach annealing at a temperature of 500-600 ° C for 30 seconds and 800°C for 10 seconds. Since Seo et al. does not disclose an anneal temperature and time, one having ordinary skill in the art would have been required to arrive at the optimal anneal temperature and time through obvious and routine experimentation.

Regarding claim 19, Seo et al. teaches forming a bit line contact on the silicide layer on a source/drain region. Seo et al. does not teach forming an Ohmic contact on the silicide layer. It would have been obvious to one having ordinary skill in the art to select metal for the bit line contact, since it is a known material that is well suited for the intended use. The selection of a known material based on its suitability for its intended use supported a *prima facie* obviousness determination in *Sinclair & Carroll Co. v. Interchemical Corp.*, 325 U.S. 327, 65 USPQ 297 (1945).

Regarding claim 21, Seo et al. teaches implanting BF₂ in the source/drain region (Col. 7, lines 44 – 45). Seo et al. does not teach a concentration of $3 \times 10^{15}/\text{cm}^3$ in the source/drain region. With respect to the concentration of the doping, it has been held that arriving at a result effective variable only requires ordinary skill in the art.

Regarding claim 22, Seo et al. teaches implanting arsenic into the source/drain regions (Col. 7, lines 7 – 13). Seo et al. does not teach a concentration of $6 \times 10^{15}/\text{cm}^3$

in the source/drain region. With respect to the concentration of the doping, it has been held that arriving at a result effective variable only requires ordinary skill in the art.

Conclusion

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. US patent No. 6,150,248 to Sekiguchi et al. teaches the common practice of using a thermal treatment to remove unreacted metal (Col. 5, lines 28 – 31). US patent No. 6,579,784 to Huang also teaches using a thermal treatment to remove unreacted metal (See abstract). US patent No. 6,436,753 to Ikeda et al. teaches concurrently forming a silicide on logic and memory regions of a device (See Figs. 14 and 15).

8. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.


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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Douglas W Owens whose telephone number is 703-308-6167. The examiner can normally be reached on Monday-Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on 703-308-2772. The fax phone numbers for the organization where this application or proceeding is assigned are 703-308-7722 for regular communications and 703-308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

DWO
August 11, 2003


TOM THOMAS
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800